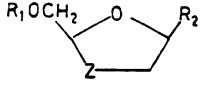
CLAIMS:

1. A compound of formula (I), the geometric and optical isomers thereof, and mixtures of those isomers:



(I)

wherein:

R_1 is selected from the group consisting of hydrogen and an acyl group having from 1 to 16 carbon atoms;

R_2 is a purine or pyrimidine base or an analogue or derivative thereof; and

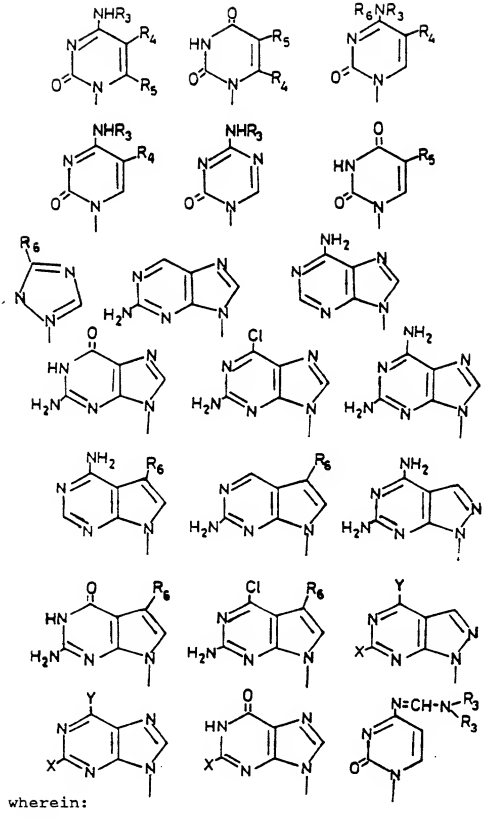
Z is selected from the group consisting of O, S, S=O, and SO_2; and

pharmaceutically acceptable derivatives of such compounds.

2. A compound according to claim 1 wherein R_1 is selected from the group consisting of acetyl, hexonyl, and aroyl.

3. A compound according to claim 2 wherein R_1 is benzoyl which may be substituted in any position with a group selected from the group consisting of OH, NO_2, CF_3, NH_2, bromine, chlorine, fluorine, iodine, C_{1-6} alkyl, and C_{1-6} alkoxy.

4. A compound of formula (I) as defined in any one of claims 1 to 3 wherein R_2 is selected from:



wherein:

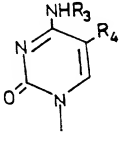
R_3 is selected from the group of hydrogen, acetyl, and C_{1-6} alkyl groups;

R_4 and R_5 are independently selected from the group consisting of hydrogen, hydroxymethyl, trifluoromethyl, substituted or unsubstituted C_{1-6} alkyl or alkenyl, bromine, chlorine, fluorine, and iodine;

R_6 is selected from the group consisting of hydrogen, cyano, carboxy, ethoxycarbonyl, carbamoyl, and thiocarbamoyl; and

X and Y are independently selected from the group consisting of hydrogen, bromine, chlorine, fluorine, iodine, amino, and hydroxyl groups.

5. A compound according to claim 4 wherein R_2 is



wherein:

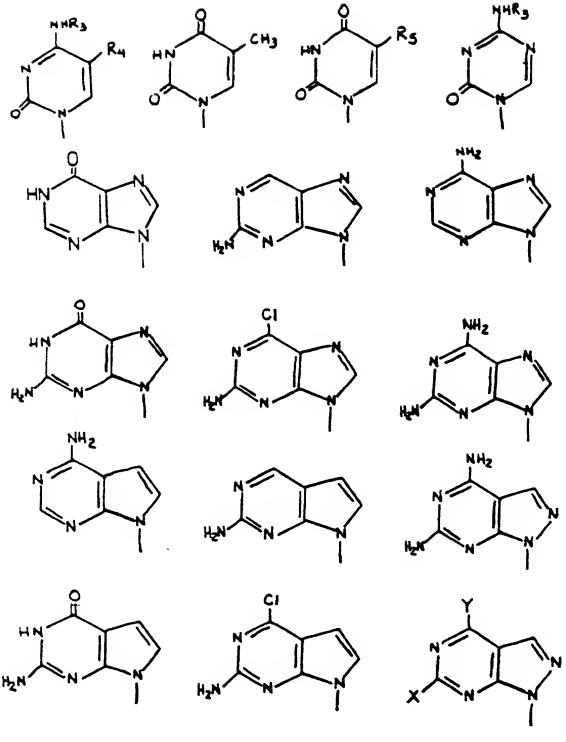
R_3 is selected from the group consisting of hydrogen, acetyl, and C_{1-6} alkyl groups; and

R_4 is selected from the group consisting of hydrogen, hydroxymethyl, trifluoromethyl, substituted or unsubstituted, C_{1-6} alkyl or alkenyl, bromine, chlorine, fluorine, and iodine.

6. A compound according to any one of claims 1 to 3, wherein:

Z is selected from a group consisting of S, S=O and SO_2; and

R_2 is selected from the group consisting of:



wherein:

R_3 and R_4 are independently selected from the group consisting of hydrogen and C_{1-6} alkyl groups;

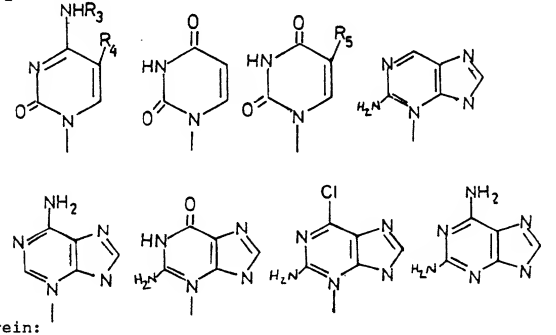
R_5 is selected from the group consisting of hydrogen, C_{1-6} alkyl, bromine, chlorine, fluorine, and iodine; and

X and Y are independently selected from the group consisting of bromine, chlorine, fluorine, iodine, amino and hydroxyl groups.

7. A compound according to claim 1, wherein:

Z is O; and

R_2 is selected from the group consisting of



wherein:

R_3 is selected from the group consisting of hydrogen and lower alkyl radicals having from 1 to 3 carbon atoms;

R_4 is selected from the group consisting of hydrogen, lower alkyl or alkenyl radicals having from 1 to 3 carbon atoms; and

R_5 is selected from the group consisting of lower alkyl or alkenyl radicals having from 1-3 carbon atoms, fluoro and iodo.

8. A compound according to claim 7, wherein R_1 is selected from the group consisting of a benzoyl or a benzoyl substituted in any position by at least one bromine, chlorine, fluorine, iodine, C_{1-6} alkyl, C_{1-6} alkoxy, nitro or trifluoromethyl group.

9. A compound of formula (I) as defined in any one of claims 1 to 3 in the form of its cis isomer.

10. A compound selected from the group consisting of:

Cis-2-hydroxymethyl-5-(N_4'-acetyl-cytosin-1'-yl)-1,3-oxathiolane, trans-2-hydroxymethyl-5-(N_4'-acetyl-cytosin-1'-yl)-1,3-oxathiolane, and mixtures thereof;

Cis-2-hydroxymethyl-5-(N-dimethylamino-methylene cytosin-1'-yl)-1,3-oxathiolane;

Bis-Cis-2-succinyloxymethyl-5-(cytosin-1'-yl)-1,3-oxathiolane;

Cis-2-benzoyloxymethyl-5-(6'-chloropurin-N-9'-yl)-1,3-oxathiolane; trans-2-benzoyloxymethyl-5-(6'-chloropurin-N-9'-yl)-1,3-oxathiolane, and mixtures thereof;

Cis-2-hydroxymethyl-5-(6'-hydroxypurin-N-9'-yl)-1,3-oxathiolane, trans-2-hydroxymethyl-5-(6'-hydroxypurin-N-9'-yl)-1,3-oxathiolane, and mixtures thereof;

Cis-2-benzoyloxymethyl-5-(uracil-N-1'-yl)-1,3-oxathiolane, trans-2-benzoyloxymethyl-5-(uracil-N-1'-yl)-1,3-oxathiolane, and mixtures thereof;

Cis-2-benzoyloxymethyl-5-(thymin-N-1'-yl)-1,3-oxathiolane, trans-2-benzoyloxymethyl-5-(thymin-N-1'-yl)-1,3-oxathiolane, and mixtures thereof;

Cis-2-benzoyloxymethyl-5-(N_4'-acetyl-5'-fluorocytosin-1'-yl)-1,3-oxathiolane, trans-2-benzoyloxymethyl-5-(N_4'-acetyl-5'-fluorocytosin-1'-yl)-1,3-oxathiolane, and mixtures thereof;

Cis-2-hydroxymethyl-5-(5'-fluorocytosin-1'-yl)-1,3-oxathiolane, trans-2-hydroxymethyl-5-(5'-fluorocytosin-1'-yl)-1,3-oxathiolane, and mixtures thereof;

Cis-2-hydroxymethyl-5-(N-dimethylamino methylene cytosin-1'-yl)-1,3-dioxolane, trans-2-hydroxymethyl-4-(N-dimethylamino methylene cytosin-1'-yl)-1,3-dioxolane, and mixtures thereof;

and pharmaceutically acceptable derivatives thereof in the form of a racemic mixture or single enantiomer.

11. A compound selected from the group consisting of:

Cis-2-benzoyloxymethyl-5-(cytosin-1'-yl)-1,3-oxathiolane, trans-2-benzoyloxymethyl-5-(cytosin-1'-yl)-1,3-oxathiolane, and mixtures thereof;

Cis-2-benzoyloxymethyl-5-(N_4'-acetyl-cytosin-1'-yl)-1,3-oxathiolane, trans-2-benzoyloxymethyl-5-(N_4'-acetyl-cytosin-1'-yl)-1,3-oxathiolane, and mixtures thereof; and

Cis-2-hydroxymethyl-5-(cytosin-1'-yl)-3-oxo-1,3-oxathiolane;

Cis-2-hydroxymethyl-5-(cytosin-1'-yl)-1,3-oxathiolane; trans-2-hydroxymethyl-5-(cytosin-1'-yl)-1,3-oxathiolane; and mixtures thereof;

Cis-2-hydroxymethyl-5-(uracil-N-1'-yl)-1,3-oxathiolane;

Cis-2-hydroxymethyl-5-(adenin-9'-yl)-1,3-oxathiolane, trans-2-hydroxymethyl-5-(adenin-9'-yl)-1,3-oxathiolane, and mixtures thereof;

Cis-2-hydroxymethyl-5-(inosin-9'-yl)-1,3-oxathiolane, trans-2-hydroxymethyl-5-(inosin-9'-yl)-1,3-oxathiolane, and mixtures thereof;

Cis-2-hydroxymethyl-5-(thymin-N-1'-yl)-1,3-oxathiolane;

and pharmaceutically acceptable derivatives thereof in the form of a racemic mixture or single enantiomer.

12. A compound selected from the group consisting of:

Cis-2-acetoxymethyl-4-(thymin-1'-yl)-1,3-dioxolane, trans-2-acetoxymethyl-4-(thymin-1'-yl)-1,3-dioxolane, and mixtures thereof;

Cis-2-hydroxymethyl-4-(thymin-1'-yl)-1,3-dioxolane, trans-2-hydroxymethyl-4-(thymin-1'-yl)-1,3-dioxolane, and mixtures thereof;

Cis-2-benzoyloxymethyl-4-(cytosin-1'-yl)-1,3 dioxolane, trans-2-benzoyloxymethyl-4-(cytosin-1'-yl)-1,3 dioxolane, and mixtures thereof;

Cis-2-hydroxymethyl-4-(cytosin-1'-yl)-1,3-dioxolane, trans-2-hydroxymethyl-4-(cytosin-1'-yl)-1,3-dioxolane, and mixtures thereof;

Cis-2-benzoyloxymethyl-4-(adenin-9'-yl)-1,3-dioxolane, trans-2-benzoyloxymethyl-4-(adenin-9'-yl)-1,3-dioxolane, and mixtures thereof;

Cis-2-hydroxymethyl-4-(adenin-9'-yl)-1,3-dioxolane, trans-2-hydroxymethyl-4-(adenin-9'-yl)-1,3-dioxolane, and mixtures thereof;

Cis-2-benzoyloxylmethyl-4-(2'-amino-6'-chloro-(purin-9'-yl)-1,3-dioxolane, trans-2-benzoyloxylmethyl-4-(2'-amino-6'-chloro-(purin-9'-yl)-1,3-dioxolane, and mixtures thereof;

Cis-2-hydroxymethyl-4-(2'-amino-6'-chloro-(purin-9'-yl)-1,3-dioxolane, trans-2-hydroxymethyl-4-(2'-amino-6'-chloro-(purin-9'-yl)-1,3-dioxolane, and mixtures thereof;

Cis-2-hydroxymethyl-4-(2'-amino-purin-9'-yl)-1,3-dioxolane, trans-2-hydroxymethyl-4-(2'-amino-purin-9'-yl)-1,3-dioxolane, and mixtures thereof;

Cis-2-hydroxymethyl-4-(2',6'-diamino-purin-9'-yl)-1,3- dioxolane, trans-2-hydroxymethyl-4-(2',6'-diamino-purin-9'-yl)-1,3- dioxolane, and mixtures thereof;

Cis-2-hydroxymethyl-4-(guanin-9'-yl)-1,3-dioxolane, trans-2-hydroxymethyl-4-(guanin-9'-yl)-1,3-dioxolane, and mixtures thereof;

and pharmaceutically acceptable derivatives thereof in the form of a racemic mixture or single enantiomer.

13. Cis-2-hydroxymethyl-5-(cytosin-1'-yl)-1,3-oxathiolane, and pharmaceutically acceptable derivatives thereof.

14. Cis-2-hydroxymethyl-5-(5'-fluorocytosin-1'-yl)-1,3-oxathiolane, and pharmaceutically acceptable derivatives thereof.

15. A compound according to any one of claims 10 to 14 in the form of a racemic mixture.

16. A compound according to any one of claims 10 to 14 substantially in the form of a single enantiomer.

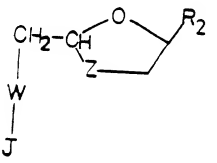
17. An active therapeutic agent consisting essentially of a compound of formula (I) as defined in any one of claims 1 to 3 or a pharmaceutically acceptable derivative thereof.

18. A therapeutic effective against viral infections consisting essentially of a compound of formula (I) as defined in any one of claims 1 to 3 or a pharmaceutically acceptable derivative thereof.

19. A pharmaceutical formulation comprising a compound of formula (I) as defined in any one of claims 1 to 3 or a pharmaceutically acceptable derivative thereof together with a pharmaceutically acceptable carrier therefor.

20. A pharmaceutical formulation according to claim 19 additionally comprising a further therapeutic agent.

21. The ester of formula (IV), the geometric and optical isomers thereof, and mixtures of those isomers:



(IV)

wherein:

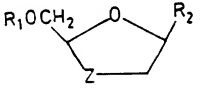
W is PO_4^-, SPO_3^-, or -O-C-$(CH_2)_n$-C-O- where n is an integer of 1 to 10;

J is any nucleoside or nucleoside analog or derivative thereof;

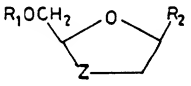
Z is O, S, S=O, or SO_2; and

R_2 is a purine or pyrimidine base or analogue or derivative thereof.

22. A compound according to claim 21 wherein J is:



23. A process for preparing an oxathiolane of formula (Ia), the geometric and optical isomers thereof, and mixtures of those isomers:



(Ia)

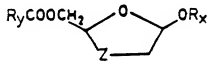
wherein:

R_1 is selected from a group consisting of hydrogen, an acyl group having from 1 to 16 carbon atoms, and a hydroxyl protecting group;

R_2 is a purine or pyrimidine base or an analogue or derivative thereof;

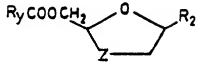
Z is selected from a group consisting of S, S=O, and SO_2; the process comprising the steps of:

a) reacting a compound having the formula $HSCH_2CH(OR_x)_2$, wherein R_x is substituted or unsubstituted C_{1-6} alkyl, with a compound having formula $R_yCO\text{-}OCH_2CHO$, wherein R_y is substituted or unsubstituted C_{1-6} alkyl or substituted or unsubstituted aryl, in an inert solvent containing an acid catalyst to produce an intermediate having a formula:



b) reacting the intermediate with a silylated pyrimidine or purine base or an analogue

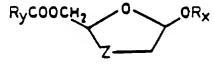
thereof, in the presence of a Lewis acid to produce a compound of the formula:



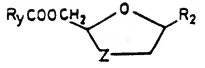
c) optionally treating the resulting compound with an oxidizing agent in a suitable solvent to produce the corresponding sulfoxides of formula (Ia), wherein Z is S=O or SO_2.

24. A process for preparing a compound according to claim 6, the geometric and optical isomers thereof, and mixtures of those isomers; the process comprising the steps of:

a) reacting a compound having a formula $HSCH_2CH(OR_x)_2$, wherein R_x is substituted or unsubstituted C_{1-6} alkyl, with a compound having formula $R_yCO\text{-}OCH_2CHO$, wherein R_y is substituted or unsubstituted C_{1-6} alkyl or substituted or unsubstituted aryl, in an inert solvent containing an acid catalyst to produce an intermediate having a formula:

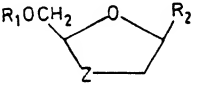


b) treating the intermediate with a silylated pyrimidine or purine base or an analogue thereof, in the presence of a Lewis acid to produce a compound of the formula:



c) optionally treating the resulting compound with an oxidizing agent in a suitable solvent to produce the corresponding sulfoxides of formula (Ia), wherein Z is S=O or SO_2.

25. A process for preparing an oxathiolane of formula (Ia), the geometric and optical isomers thereof, and mixtures of those isomers:



(Ia)

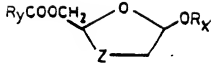
wherein:

R_1 is selected from a group consisting of hydrogen, an acyl group having from 1 to 16 carbon atoms, and a hydroxyl protecting group;

R_2 is a purine or pyrimidine base or an analogue or derivative thereof; and

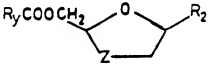
Z is selected from a group consisting of S, S=O or SO_2; the process comprising the steps of:

a) reacting a mercaptoacetaldehyde with a compound having formula $R_yCO\text{-}OCH_2CHO$, wherein R_y is substituted or unsubstituted $C_{1\text{-}6}$ alkyl or substituted or unsubstituted aryl, to produce an intermediate having a formula:

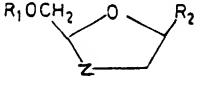


b) converting the hydroxyl group of the intermediate to a suitable leaving group; and

c) treating the intermediate with a silylated pyrimidine or purine base or an analogue thereof, in the presence of a Lewis acid to produce a compound of the formula:



26. A process for preparing an oxathiolane of formula (Ia), the geometric and optical isomers thereof, and mixtures of those isomers:



(Ia)

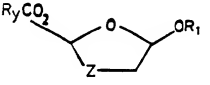
wherein:

R_1 is selected from a group consisting of hydrogen, an acyl group having from 1 to 16 carbon atoms, and a hydroxyl protecting group;

R_2 is a purine or pyrimidine base or an analogue or derivative thereof; and

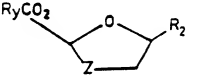
Z is selected from a group consisting of S, S=O, and SO_2; the process comprising the steps of:

a) treating a mercaptoacetaldehyde with a compound having formula $R_yOOCCHO$, wherein R_y is substituted or unsubstituted C_{1-6} alkyl or substituted or unsubstituted aryl, to produce an intermediate having a formula:



b) converting the hydroxyl group of the intermediate to a suitable leaving group; and

c) treating the intermediate with a silylated pyrimidine or purine or an analogue thereof, in the presence of a Lewis acid to produce a compound of the following formula:



d) reducing the R_y containing ester and protecting the resulting hydroxyl group with a suitable protecting group;

e) optionally interconverting the purine or pyrimidine base substituent to another pyrimidine or purine base;

f) removing the protecting group to give a compound of formula (Ia).

27. A process for preparing an oxathiolane of formula (Ia), the geometric and optical isomers thereof, and mixtures of those isomers:

(Ia)

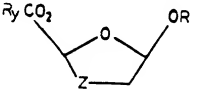
wherein:

R_1 is selected from a group consisting of hydrogen, an acyl group having from 1 to 16 carbon atoms, and a hydroxyl protecting group;

R_2 is a purine or pyrimidine base or an analogue or derivative thereof; and

Z is selected from a group consisting of S, S=O, and SO_2; the process comprising the steps of:

a) converting the hydroxyl group of an intermediate of the following formula to a suitable leaving group:



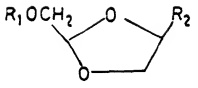
wherein R_Y is C_{1-6} substituted or unsubstituted alkyl or substituted or unsubstituted aryl;

b) reducing the ester group and protecting the resulting hydroxyl group with a suitable protecting group;

c) reacting the intermediate with a silylated pyrimidine or purine base or an analogue thereof, in the presence of a Lewis acid;

d) removing the protecting group to give a compound of formula (Ia).

28. A process for preparing a dioxolane of formula (Ib), the geometric and optical isomers thereof, and mixtures of those isomers,



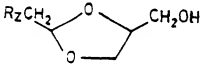
(Ib)

wherein:

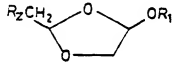
R_1 is selected from a group consisting of hydrogen, an acyl group having from 1 to 16 carbon atoms, and a hydroxyl protecting group; and

R_2 is a purine or pyrimidine base or an analogue or derivative thereof; the process comprising the steps of:

a) condensing a compound having a formula $R_zCH_2CH(OR_x)$, wherein R_z is a halo selected from bromo, chloro, fluoro or iodo and R_x is substituted or unsubstituted C_{1-6} alkyl, with glycerol in an inert solvent containing an acid catalyst to produce an intermediate having a formula



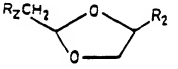
b) oxidizing the hydroxymethyl group of the intermediate with an oxidizintg agent to the acid and further oxidizing with an organic peracid to produce a compound of the following formula



wherein R_y is substituted or unsubstituted C_{1-6} alkyl or substituted or unsubstituted aryl;

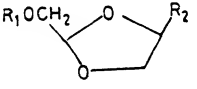
c) treating the intermediate with a silylated pyrimidine or purine base or an analogue

therof, in the presence of a Lewis acid to produce a compound of the following formula



d) displacing the R_z group with a salt of an acid.

29. A process for preparing a dioxolane of formula (Ib), the geometric and optical isomers thereof, and mixtures of those isomers,



(Ib)

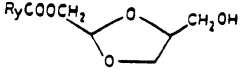
wherein:

R_1 is selected from a group consisting of hydrogen, an acyl group having from 1 to 16 carbon atoms and a hydroxyl protecting group; and

R_2 is a purine or pyrimidine base or an analogue or derivative thereof; the process comprising the steps of:

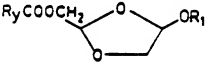
a) condensing a compound having a formula $R_zCH_2CH(OR_x)$, wherein R_z is a halo selected from bromo, chloro, fluoro or iodo and R_x is substituted or unsubstituted C $_{1-6}$ alkyl, with glycerol in an inert solvent containing an acid catalyst to produce an intermediate having a formula

b) displacing the R_z group with a salt of an acid to produce a compound of the following formula

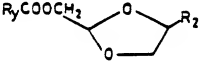


wherein R_y is substituted or unsubstituted C_{1-6} alkyl or substituted or unsubstituted aryl;

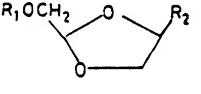
c) oxidizing the hydroxymethyl group of the intermediate with an oxidizing agent to the acid and further oxidizing with an organic peracid to produce a compound of the following formula



d) treating the intermediate with a silylated pyrimidine or purine base or an analogue thereof, in the presence of a Lewis acid to produce a compound of the following formula



30. A process for preparing a dioxolane of formula (Ib), the geometric and optical isomers thereof, and mixtures of those isomers:



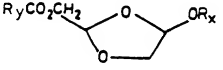
(Ib)

wherein:

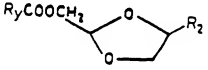
R_1 is selected from a group consisting of hydrogen, an acyl group having from 1 to 16 carbon atoms, and a hydroxyl protecting group; and

R_2 is a purine or pyrimidine base or an analogue or derivative thereof; the process comprising the steps of:

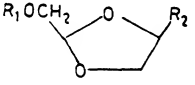
a) condensing a compound having a formula $R_yCO\text{-}OCH_2CHO$, wherein R_y is substituted or unsubstituted C_{1-6} alkyl or substituted or unsubstituted aryl, with the hydroxyacetal of formula $HOCH_2CH(OR_x)_2$, wherein R_x is a substituted or unsubstituted C_{1-6} alkyl, in an inert solvent containing an acid catalyst to produce an intermediate having a formula:



b) treating the intermediate with a silylated pyrimidine or purine base or an analogue thereof, in the presence of a Lewis acid to produce a compound of the following formula:



31. A process for preparing a dioxolane of formula (Ib), the geometric and optical isomers thereof, and mixtures of those isomers:



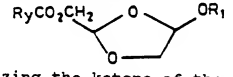
(Ib)

wherein:

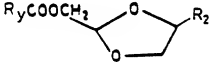
R_1 is selected from a group consisting of hydrogen, an acyl group having from 1 to 16 carbon atoms, and a hydroxyl protecting group; and

R_2 is a purine or pyrimidine base or an analogue or derivative thereof; the process comprising the steps of:

a) condensing a compound having a formula $R_yCO\text{-}OCH_2CHO$, wherein R_y is substituted or unsubstituted $C_{1\text{-}6}$ alkyl or substituted or unsubstituted aryl, with an epoxide in an inert solvent containing an acid catalyst to produce an intermediate having a formula:



b) oxidizing the ketone of the intermediate with an organic peracid and treating the intermediate with a silylated pyrimidine or purine base or an analogue thereof, in the presence of a Lewis acid to produce a compound of the following formula:



32. A method for preventing or treating human immunodeficiency virus infections in mammals characterized by administering to a mammal an anti-

viral effective amount of a compound according to any one of claims 1 to 3.

33. A method for preventing or treating human immunodeficiency virus infections in mammals, characterized by administering to a mammal an anti-viral effective amount of a compound according to claim 6.

34. A method for preventing or treating human immunodeficiency virus infections in mammals, characterized by administering to a mammal an anti-viral effective amount of a compound according to claim 7 or claim 8.

35. Intermediates useful for the production of oxathiolane compounds selected from the group consisting of:

2-thiobenzoylacetaldehyde diethylacetal; and

cis- and trans-2-benzoyloxymethyl-5-ethoxy-1,3-oxathiolane.

36. Intermediates useful for the production of oxathiolane and dioxolane compounds selected from the group consisting of:

cis- and trans-2-chloromethyl-4-(m-chloro-benzoyloxy)-1,3-dioxolane;

cis- and trans-2-benzoyloxymethyl-1,3-dioxolane-4-carboxylic acid; and

cis- and trans-2-benzoyloxymethyl-4-(m-chlorobenzoyloxy)-1,3-dioxolane.

37. Intermediates useful for the production of oxathiolane and dioxolane compounds selected from the group consisting of:

cis- and trans-2-benzoyloxymethyl-5-hydroxy-1,3-oxathiolane;

cis- and trans-2-benzoyloxymethyl-5-acetoxy-1,3-oxathiolane;

cis- and trans-2-ethoxycarbonyl-5-hydroxy-1,3-oxathiolane;

cis- and trans-2-ethoxycarbonyl-5-acetoxy-1,3-oxathiolane;

cis- and trans-2-ethoxycarbonyl-5-(uracil-1'-yl)-1,3-oxathiolane;

cis- and trans-2-t-butyldimethylsilyloxy-methyl-5-(uracil-1'-yl)-1,3-oxathiolane;

cis- and trans-2-t-butyldimethylsilyloxy-methyl-5-(cytosin-1'-yl)-1,3-oxathiolane;

cis- and trans-2-ethoxycarbonyl-5-(methoxy-carbonyloxy)-1,3-oxathiolane;

cis- and trans-2-t-butyldiphenylsilyloxy-methyl-5-(methoxycarbonyloxy)-1,3-oxathiolane;

cis- and trans-2-t-butyldiphenylsilyloxy-methyl-5-(cytosin-1'-yl)-1,3-oxathiolane;

cis- and trans-2-t-butyldiphenylsilyloxy-methyl-5-(N-acetylcytosin-1'-yl)-1,3-oxathiolane;

2-benzoyloxyacetaldehyde bis (2-methoxyethyl) acetal;

2-hydroxyacetaldehyde bis(2-methoxyethyl) acetal;

cis- and trans-2-benzoyloxymethyl-4-(2-methoxyethoxy)-1,3-dioxolane;

cis- and trans-2-benzoyloxymethyl-4-acetyl-1,3-dioxolane;

cis- and trans-2-benzoyloxymethyl-4-acetoxy-1,3-dioxolane;

2-thiobenzoylacetaldehyde bis(2-methoxy-ethyl) acetal;

2-thioacetaldehyde bis(2-methoxyethyl acetal;

cis- and trans-2-benzoyloxymethyl-5-(2-methoxyethoxy)-1,3-oxathiolane;

cis- and trans-2-hydroxymethyl-5-hydroxy-1,3-oxathiolane; and

cis- and trans-2-acetoxymethyl-5-1,3-oxathiolane.